

LEAF AND STEM DISEASE OF TORREYA TAXIFOLIA IN FLORIDA

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The Florida *Torreya* (*Torreya taxifolia* Arn.) belongs to the yew family Taxaceae. It is a conifer tree with whorled branches and stiff, sharply-pointed, needle-like leaves (5) which emit a pungent odor when bruised. Because of this odor the common name "stinking cedar" is often used for the plant (1). Other names are "gopher wood", "yew-leaved *Torreya*", "foetid yew", "polecat wood", and "savin" (2,3,6,9,10). This plant was named in honor of Dr. John Torrey, a renowned botanist (1). The wood of *T. taxifolia* is very durable when exposed to weather or soil and was used extensively for fence posts, shingles, and other exposed constructions by early settlers. Soon nearly all the larger trees had been cut and as the number of trees had been seriously depleted, there was concern for the continued existence of the species. With reduced cutting and land clearing, the species was able to maintain itself for a period of time. In the past, healthy trees reached heights of 18 meters (5). Since 1962, however, natural populations have drastically diminished for reasons not fully understood (1). No reproduction from seed is taking place and only stump sprouts can be found in native areas. The Florida *Torreya* is listed as endangered under Florida Statutes Section 581.185 and by the Fish and Wildlife Service, U. S. Dept. of the Interior (Federal Register 1/23/84) (5).

The purpose of this circular is to provide: 1) an update on microorganisms associated with leaf and stem disease of *T. taxifolia* (root-inhabiting microorganisms are not included in this discussion), 2) illustrations of some of these leaf and stem microorganisms, 3) to provide inspectors, growers, and the public information on the decline of the Florida *Torreya*.

DISTRIBUTION. The Florida *Torreya* is found in a 20-mile area on wooded slopes and in wooded ravines of the hill country along the east side of the Apalachicola River, occurring in Gadsden, Liberty, and Jackson counties, Florida, and extending a mile or less into Decatur county, Georgia, near the town of Chattahoochie (1,2,3,6,9,10). Fossil records suggest that at one time it grew over much of the eastern United States (2).

ASSOCIATED MICROORGANISMS. Of the microorganisms associated with *T. taxifolia*, a fungus tentatively identified as *Physalospora* Niessl. (Fig. 1) was observed to occur frequently on stems and needles in association with *Phyllosticta* Pers. ex Desm. (8) (Fig. 2), the imperfect state of *Guignardia* Viala & Ravaz (8). *Physalospora* sp. was never successfully established in pure culture despite many repeated attempts at isolation of ascospores. *Xylocoremium flabelliforme* (Schw.: Fr.) J. D. Rogers, (7) (Fig. 3), the imperfect state of *Xylaria cubensis* (Mont.) Fr. (7), *Fusarium*

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lateritium Nees and others were isolated. Conidia of Phyllosticta sp., X. flabelliforme, and F. lateritium were spray inoculated onto 2-yr-old healthy cuttings. Only F. lateritium infected needles in the absence of wounds and symptoms developed within three days (4) (Fig. 5). Infected needles fell off within 2 weeks after inoculation and sporodochia of the fungus were evident on the lower side of the needles along the two bands of stomates. This constitutes added information and is the first documented report of proven pathogenicity (4). However, F. lateritium was infrequently isolated.

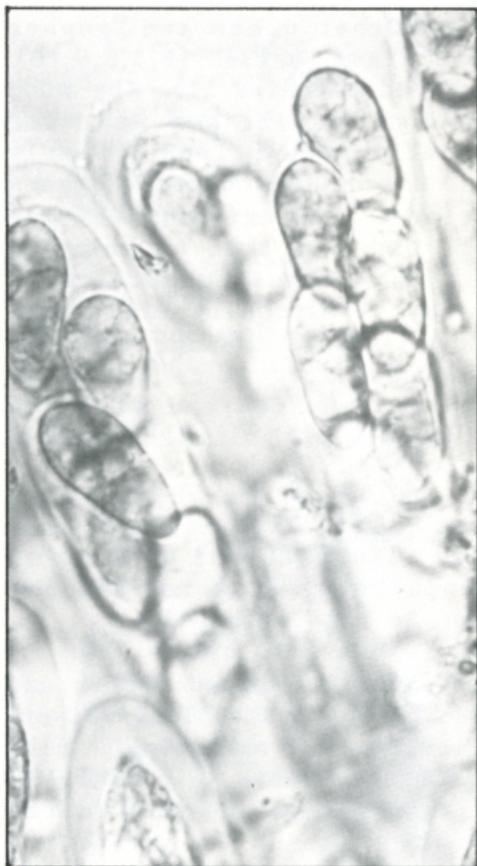


Fig. 1. (left) Physalospora sp. - Bitunicate asci containing ascospores (1,155X).

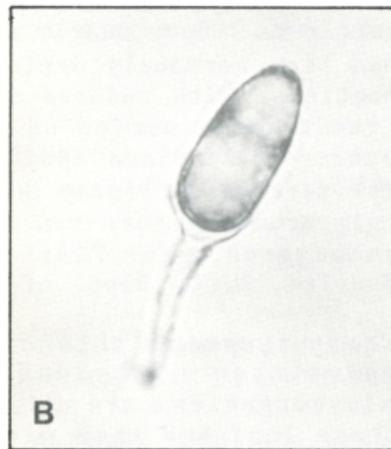
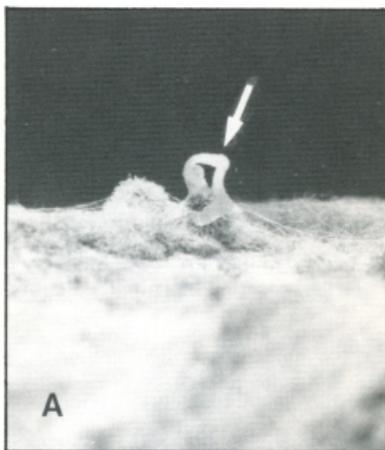
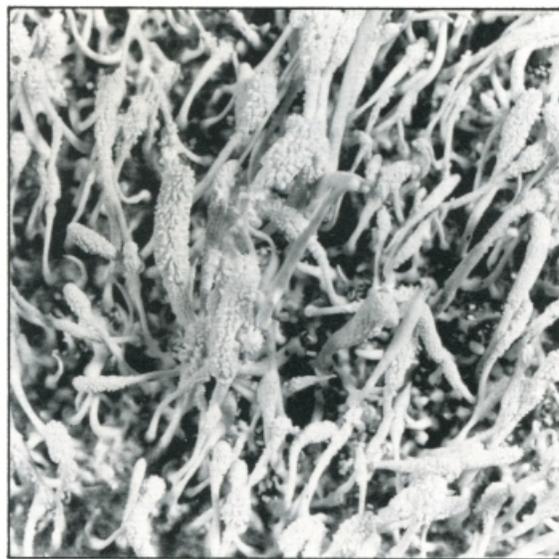
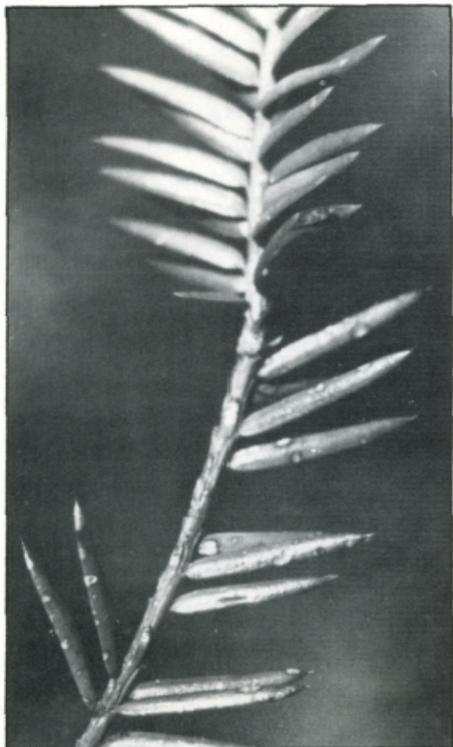


Fig. 2. Phyllosticta sp. **A)** Pycnidia on stem exuding conidia in tendrils as indicated by arrow. **B)** Conidium showing a hyaline gelatinous appendage (1,155X).

Fig. 3. Xylocoremium flabelliforme produced in culture, and showing synnemata with terminal conidiophores bearing conidia.



SYMPTOMS. In *Torreya's* natural habitat, symptoms appear to be initiated on the needles which show small, tan, circular (up to 3mm in diameter) spots, or spots with white to tan center and dark border (Fig. 4). Spots per needle are usually one to a few in number, enlarging or coalescing until the entire needle becomes necrotic.



Invasion by the microorganism progresses through the needle into the stem, followed by abscission of the needles. As various degrees of defoliation become manifest, the stems appear essentially bare with small tufts of new growth at the tips. Fungus fruiting structures occur on stems and the undersurface of needles. Severely diseased trees are marked by much needle and stem necrosis and severe defoliation. Often, entire branches will turn yellow, then brown. Swollen gall-like symptoms with roughened bark on *Torreya* branches were observed by the senior author on the University of Florida campus in Gainesville. These symptoms are similar to the rough bark disease of *Pittosporum tobira* (Thunb.) Ait, a popular ornamental landscape shrub in Florida.

Fig. 4. The stem and needle blight of *Torreya taxifolia* showing small, circular spots on the needles.

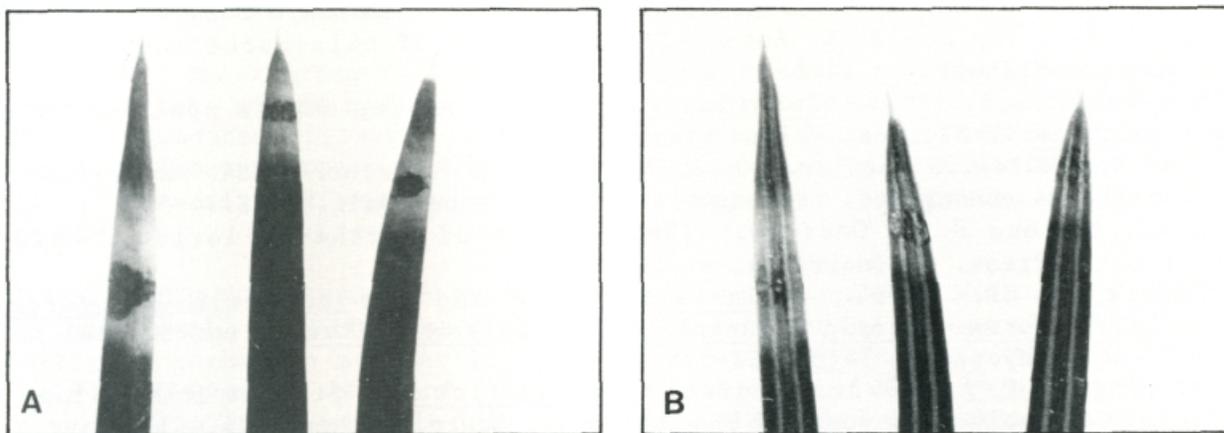


Fig. 5. Leaf spots caused by *Fusarium lateritium* under laboratory conditions. **A)** Upper surface. **B)** Lower surface.

In 1986, Dr. E. L. Barnard (personal communication) observed the following: 1) areas of roughened bark resulting in elongated fusiform swellings on branches of saplings at Maclay Gardens State Park in Tallahassee and 2) canker-like swellings at the base of several sprouts at the *Torreya* State Park located in Liberty county. The causes of these abnormalities remain undetermined.

CONTROL. The recommended application of a maneb fungicide at weekly intervals provided very good control in 9 weeks (1). The treated blight affected Torreya trees showed marked improvement and recovery with much evidence of new growth showing little or no infection (1). However, no fungicides are specifically labeled for use on T. taxifolia.

Cultures of Torreya shoot-tips often show contamination with fungi. Experimental studies with systemic fungicides such as thiophanate methyl + zinc ion.+ maneb complex or thiabendazole have shown promise in eliminating fungi from stock plants when sprayed weekly for 4 weeks (L. Barnes: personal communication). However, these fungicides are not EPA-registered.

Every effort should be made to save and to replenish this rare tree by all available means, to ascertain the most suitable habitat, encourage research on the stress factors affecting tree survival and distribution, and on various microorganisms that have been found associated with the stem and needle blight which is contributing to its demise. Tissue culture methods are being investigated to preserve and propagate T. taxifolia as well as other endangered species.

SURVEY AND DETECTION. Look for small, tan, circular spots (up to 3 mm in diameter), or spots with tan center and dark border. Fungus fruiting structures occur on stems and the undersurface of needles. Severely diseased trees are marked by much needle and stem necrosis and severe defoliation.

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